An **Open Source** Dataset and **Ontology** for **Product Footprinting**
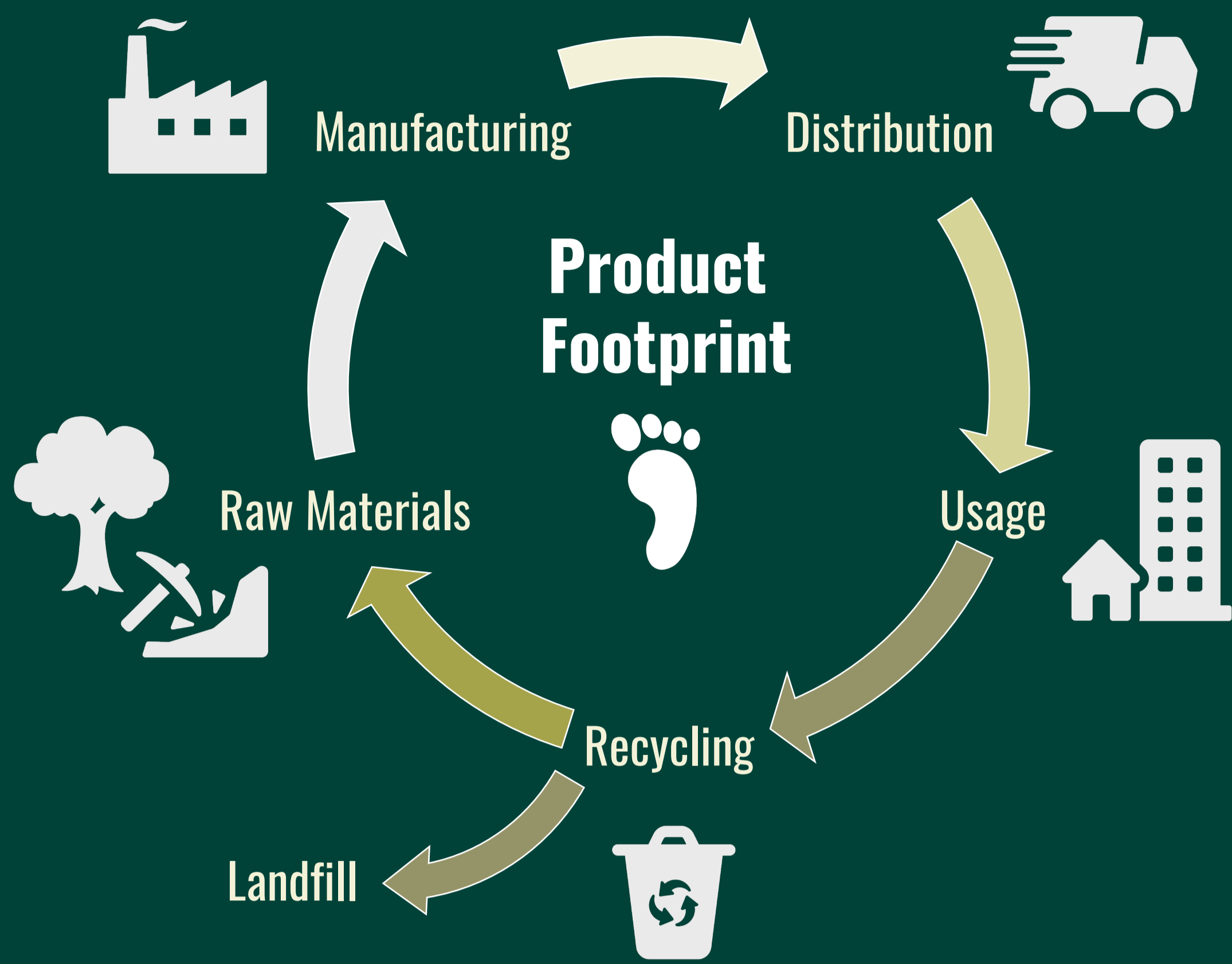
Agneta Ghose
Katja Hose
Matteo Lissandrini
Bo Pedersen Weidema

AALBORG UNIVERSITY
DENMARK

BONSAI

Product Footprint

Manufacturing → Distribution → Usage → Recycling → Landfill → Raw Materials → Manufacturing

Challenge

Current sustainability information on products – "product footprints" – is:

- Seriously **incomplete**
- Lacking in **detail**
- Generally **out-of-date**
- Difficult to **access**

Solution

An **Open Dataset**, **Community Driven Ontology**, and an **Open Source Toolchain** capable of supporting LCA calculations.
A shared resource where the community can contribute to data generation, validation, and management decisions.
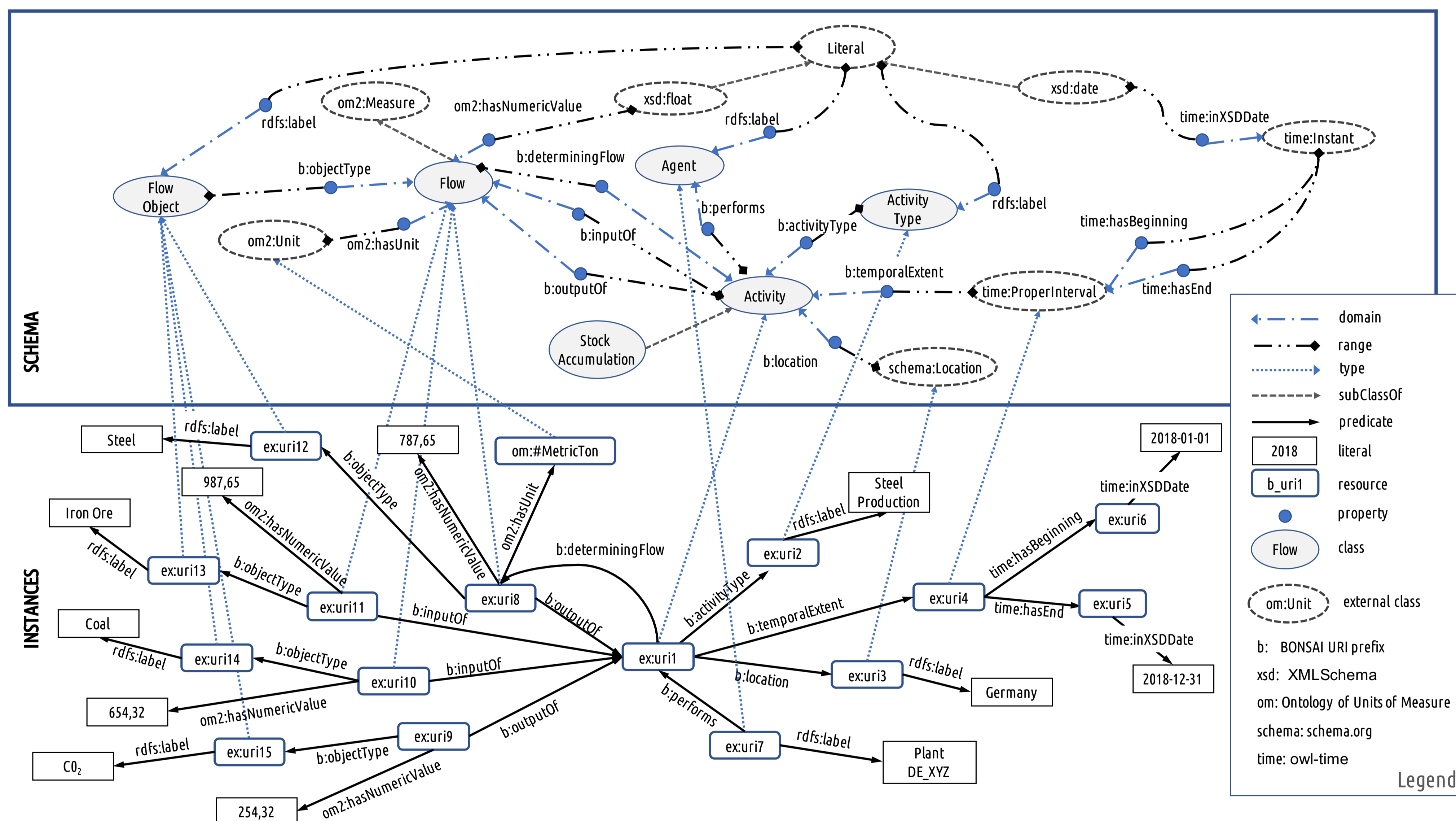
📖 Core Concepts

Activity is the act of doing within a temporal interval. Includes both human activities (e.g., production, consumption, and market activities) and environmental mechanisms (e.g., radiative forcing, pollination).

Agent is defined as an entity (person or thing) that performs an activity. An agent has a location and the location of the activity is also determined by the agent performing it.

Flow is the instance of an entity that is produced or consumed by activities or stored within an activity (e.g., stock).

Determining Flow is the flow of an activity determining its primary function. All other flows are co-produced by or demanded for in that specific activity but do not determine its existence. Usually, a change in the determining flow will affect the volume of all other flows involved.

Flow Object type of entity that is exchanged between two activities, produced or consumed by activities, or stored by a (stock accumulation) activity.

Legend:
- domain
- range
- type
- subClassOf
- predicate
- literal (2018)
- resource (b_uri1)
- property
- class (Flow)
- external class (om:Unit)
- b: BONSAI URI prefix
- xsd: XMLSchema
- om: Ontology of Units of Measure
- schema: schema.org
- time: owl-time

❓ Competency Questions

Is the flow x a determining flow for activity y?
Is steel, slag or heat the determining flow for steel production? A: Steel

What is the amount of flow x produced as output during the time period y due to the production of flow z?
What is the amount of CO_2 output in 2018 to produce steel in Germany? - Answer: 254,32 Mt CO_2 to produce 787,65 Mt steel

What is the location of the agent performing activity y?
What is the location of the plant (blast furnace) for steel production with the highest amount of CO_2 production? - Answer: China

What other agents are performing the same type of activity and where are they located?
What are the other sources of steel production in Germany? - Answer: steel recycling plant

What flows are produced as output by activity consuming flows for object x?
What are the input and output flows of steel production? Answer: In: Iron Ore, Coal – Out: Steel, blast furnace slag, CO_2

What activity types emit flow object x?
What activity types produce slag, CO_2, and oil waste as output? Answer: Steel production

Results from a technical evaluation in collaboration with 12 domain experts

Data

Sources: *Tabular data*
EXIOBASE [www.exiobase. eu] Multi-Regional Environmentally Extended Supply-Use Table
48 countries, 200 products, 19 waste fractions, 66 emission types, and 163 industries.

ENTSO-E [https://transparency.entsoe.eu/api], the European Network of Transmission System Operators for Electricity Country to Country data about Energy Generation, Trade, and Consumption

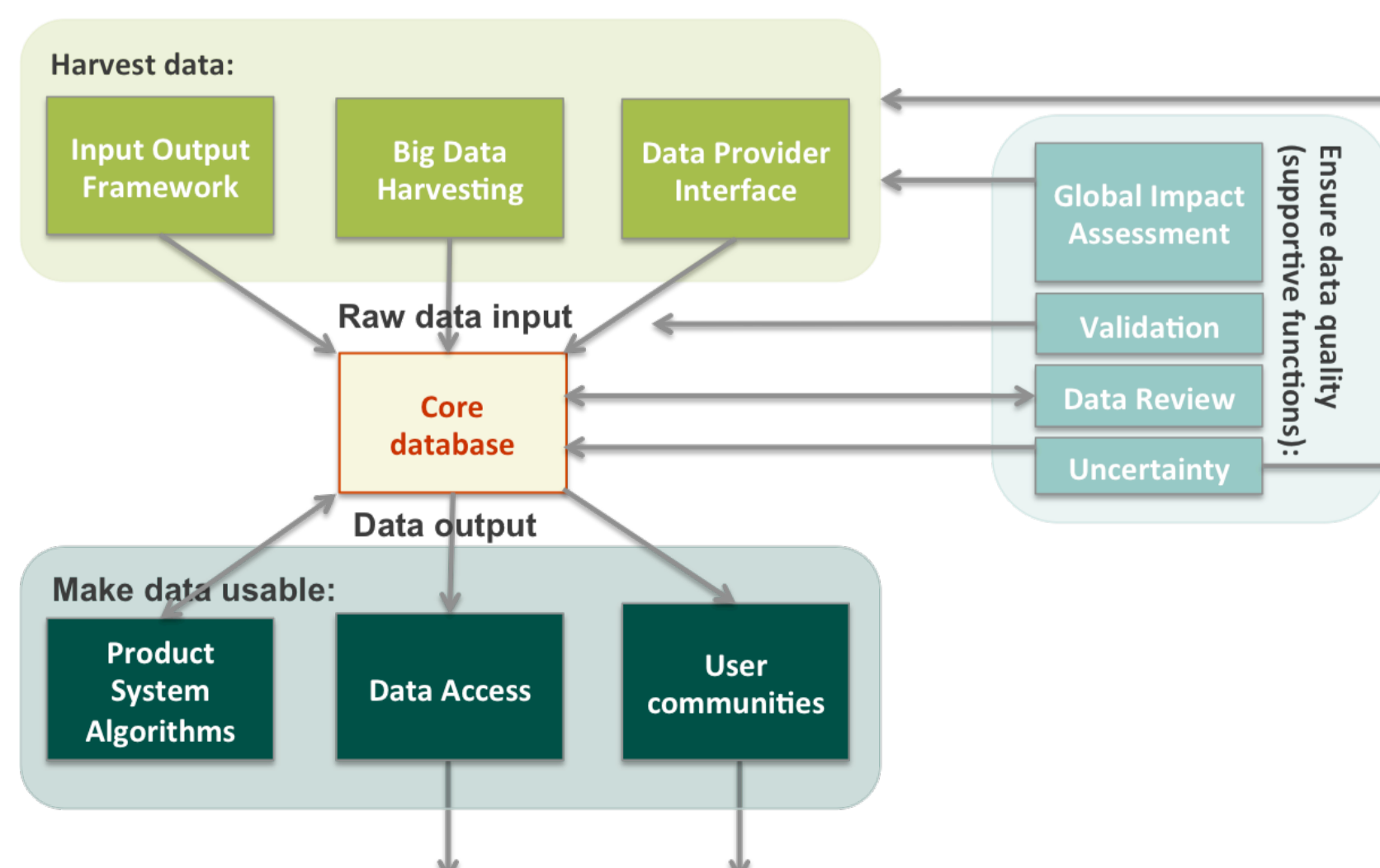**Output RDF: ~ 15M triples of core data for Exiobase'11**
+ 2K triples for Vocabularies for Electricity grid, Exiobase, Life cycle impact assessment (LCIA), US EPA (Environmental Protection Agency) classification of chemicals

Aligned with Geonames, Schema.org, Ontology of Unit of Measures (OM2)

Vision

Community driven Open-data platform,
for data ingestion, integration, validation, and sharing.
+ Connected application for LCA calculations.

Next steps
Expand and Handle Evolution

1. Prov-O Provenance
2. Integrate new Data
3. Expand the vocabulary
4. Model Uncertainty
5. Handle Versioning
6. OWL Inference

Join Us!
Your input is Welcome

https://bonsai.uno – https://github.com/BONSAMURAIS